PATENT ABSTRACTS OF JAPAN

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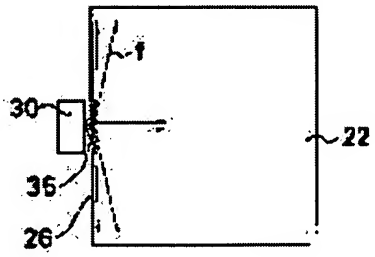
(54) SURFACE LIGHT SOURCE DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent the darkening of corner portions of a light incident face for a surface light source device using a comparatively small light source compared with the dimension of a light guide panel and make brightness distribution uniform by forming an optical pattern at an opposite place to the light source for the light incident face of the light guide panel which shuts in light led-in from the light incident face and extracts the light outward from a light emission face.



SOLUTION: A light (f) emitted from a light emitting section opposed to an optical pattern 35 of a prism array state is not led into the light guide panel due to forward deflected light. The light is led to the inside of the light guide panel 22 in a wide range by refraction through each prism that constitutes the optical pattern 35. The light reaches even the corner portions of both sides of the light incident face 26 and the brightness distribution of the surface light source device is made uniform when the corner portions becomes bright. The light incident on the light guide panel 22 from the light emitting section is uniformly emitted at each region of the light guide panel 22 and uniform brightness distribution is obtained in the whole surface of the light guide panel 22 since a diffused pattern is formed at the bottom face of the light guide panel 22.

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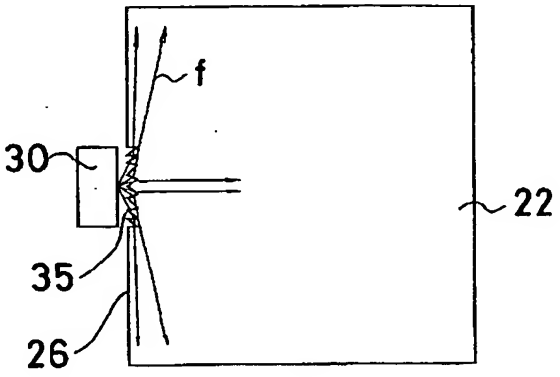
(54)【発明の名称】　面光源装置

(57)【要約】

【課題】　点光源を用いた面光源装置の隅部分を明るくすることにより、輝度分布の均一化を図る。

【解決手段】　導光板２２の光入射面にプリズムアレイ等からなる光学的パターン３５を形成し、この光学的パターン３５に対向させて発光部２８（点光源３０）を配置する。点光源３０から出た光は、光学的パターン３０に散乱され、導光板２２の隅部分にも達し、隅部分の輝度を向上させる。



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【特許請求の範囲】

【請求項１】　光入射面より導入された光を閉じ込めて光出射面から外部へ取り出すための導光板と、導光板の光入射面側に配置された、導光板の光入射面の幅と比較して小さな光源とを備えた面光源装置において、
導光板の光入射面の、前記光源と対向する箇所に、光学的パターンを形成したことを特徴とする面光源装置。

【請求項２】　導光板の光入射面に設けた凹部に前記光源を納め、当該凹部の内面に光学的パターンを形成したことを特徴とする、請求項１に記載の面光源装置。

【請求項３】　光入射面より導入された光を閉じ込めて光出射面から外部へ取り出すための導光板と、導光板の光入射面側に配置された、導光板の光入射面の幅と比較して小さな光源とを備えた面光源装置において、
導光板の光入射面に凹部を形成し、光源を当該凹部に配置するとともに、光源と凹部の間の空間の光出射面側及びその反対面側を光反射性の部材により覆ったことを特徴とする面光源装置。

【請求項４】　前記凹部を略半円形に形成し、前記光反射性の部材も略半円形に形成したことを特徴とする、請求項３に記載の面光源装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は面光源装置に関する。具体的にいうと、本発明は液晶表示装置や照明装置などに用いられる面光源装置に関する。

【０００２】

【従来の技術】従来例の面光源装置１を図１の分解斜視図及び図２の断面図により示す。面光源装置１は、光を閉じ込めるための導光板２と発光部３と反射板４とから構成されている。導光板２はポリカーボネイト樹脂やメタクリル樹脂等の透明で屈折率の大きな樹脂により成形されており、導光板２の下面には凹凸加工や拡散反射インクのドット印刷等によって拡散パターン５が形成されている。発光部３は、回路基板６上に複数の発光ダイオード（ＬＥＤ）等のいわゆる点光源７を実装したものであって、導光板２の側面（光入射面８）に対向している。反射板４は、反射率の高い例えば白色樹脂シートによって形成されており、両面テープ９によって両側部を導光板２の下面に貼り付けられている。

【０００３】しかして、図２に示すように、発光部３から出射されて光入射面８から導光板２の内部に導かれた光ｆは、導光板２内部で全反射することによって導光板２内部に閉じ込められる。導光板２内部の光ｆは拡散パターン５に入射すると拡散反射され、光出射面１０へ向けて全反射の臨界角よりも小さな角度で反射された光ｆが光出射面１０から外部へ取り出される。また、導光板２下面の拡散パターン５の存在しない箇所を透過した光ｆは、反射板４によって反射されて再び導光板２内部へ戻るので、導光板２下面からの光量損失を防止される。

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【０００４】

【発明が解決しようとする課題】点光源を用いた上記のような面光源装置１は、低消費電力化のため、点光源７で疑似的に線状光源化を図ったものであった。すなわち、点光源７を一列に配列することによって冷陰極線管のような線状光源を模したものである。従って、より低消費電力化を図るためには、点光源の数を減らして、好ましくは１つの点光源により高輝度で輝度ばらつきの少ない面光源装置を得ることが望まれる。

【０００５】しかしながら、１つの点光源７で面光源装置１を光らせようとすると、図３に示すように、導光板２の光入射面側の隅部分１１（図３で斜線を施した領域）が暗くなり、均一な輝度分布を得ることができなかった。

【０００６】本発明は叙上の従来例の欠点に鑑みてなされたものであり、その目的とするところは、導光板の寸法に比較して小さな光源を用いた面光源装置において、光入射面側の隅部分が暗くなるのを防止し、輝度分布の均一化を図ることにある。

【０００７】

【発明の開示】請求項１に記載の面光源装置は、光入射面より導入された光を閉じ込めて光出射面から外部へ取り出すための導光板と、導光板の光入射面側に配置された、導光板の光入射面の幅と比較して小さな光源とを備えた面光源装置において、導光板の光入射面の、前記光源と対向する箇所に、光学的パターンを形成したことを特徴としている。

【０００８】この面光源装置にあっては、光入射面の光源と対向する箇所に光学的パターンを形成しているので、光源から出た光が導光板に入射する際、光学的パターンを通過することによって光が周囲に拡散される。従って、導光板の光入射面側の隅部分にも光が拡散され、当該隅部分が暗くなるのを防止することができる。従って、導光板に比較して小さな光源を用いる場合にも、面光源装置の輝度分布を均一化することができる。

【０００９】請求項２に記載の実施態様は、請求項１記載の面光源装置において、導光板の光入射面に設けた凹部に前記光源を納め、当該凹部の内面に光学的パターンを形成したことを特徴としている。

【００１０】請求項２に記載の実施態様にあっては、導光板の光入射面に凹部を設けて凹部内に光源を位置させているので、凹部から面光源の隅部分へ光が広がり易くなる。さらに、凹部の内面には光学的パターンが形成されているので、光学的パターンによって光が散乱されることにより、さらに光が導光板の隅部分へ広がり易くなる。よって、導光板に比較して小さな光源を用いる場合でも、導光板の隅部分をより明るくすることができ、面光源装置の輝度分布を均一化することができる。

【００１１】請求項３に記載の面光源装置は、光入射面より導入された光を閉じ込めて光出射面から外部へ取り

出すための導光板と、導光板の光入射面側に配置された、導光板の光入射面の幅と比較して小さな光源とを備えた面光源装置において、導光板の光入射面に凹部を形成し、光源を当該凹部に配置するとともに、光源と凹部の間の空間の光出射面側及びその反対面側を光反射性の部材により覆ったことを特徴としている。

【００１２】また、請求項４に記載の実施態様は、請求項３記載の面光源装置において、前記凹部を略半円形に形成し、前記光反射性の部材も略半円形に形成したことを特徴としている。

【００１３】請求項３及び４に記載の面光源装置にあっては、導光板の光入射面に設けた凹部に光源を配置しているので、光源から出た光は凹部から導光板へ広い範囲にわたって入射する。従って、導光板の光入射面側の隅部分にも光が拡散され、当該隅部分が暗くなるのを防止することができる。従って、導光板に比較して小さな光源を用いる場合にも、面光源装置の輝度分布を均一化することができる。

【００１４】また、光源と凹部の間の空間の光出射面側及びその反対面側を光反射性の部材により覆っているから、光源から出射された光が導光板に入射することなく、光源と導光板の隙間から上方もしくは下方へ逃げるのを防止することができ、光の結合効率を向上させ、面光源装置の輝度を高くできる。

【００１５】特に、請求項４に記載の面光源装置のように、凹部及び光反射性の部材を略反円形状に形成することにより光源からの光を各方向に均等に広がらせることができ、輝度分布をより均一化することができる。

【００１６】

【発明の実施の形態】図４は本発明の一実施形態による面光源装置２１を示す分解斜視図である。屈折率の大きな透明樹脂材料によって形成されている導光板２２の上面が光出射面２３となっており、下面には凹凸加工や拡散反射インクのドット印刷等によって拡散パターン２４が形成されている。この導光板２２の下面両側部には、溝状をした反射板保持部２５が設けられており、導光板２２の光入射面２６と反対側の端面には、下方へ向けてストッパー２７が垂下されている。

【００１７】発光部２８は、白色樹脂等の表面反射率の高い材質からなる外装部材２９によって点光源３０、すなわち導光板２２に比べて小さな光源を包んだものである。例えば、樹脂モールド型発光ダイオードのような発光素子（点光源３０）を外装部材２９で包んだものである。この点光源３０は光出射側の面だけが外装部材２９から露出している。しかして、点光源３０から背面方向や側面方向へ出射された光は、外装部材２９の内面で反射され、点光源３０の光は前面のみから効率よく出射される。なお、豆電球などの点光源３０を白色樹脂等からなる外装部材２９内に納めて発光部２８を形成してもよい。

【００１８】反射板３１は表面反射率の高い材料によって形成されており、例えば硬質もしくは比較的軟質の白色プラスチックシートによって形成されている。この反射板３１は、光入射面２６側から反射板保持部２５に差し込んでストッパー２７に当てることにより、導光板２２下面に保持される。

【００１９】また、導光板２２の光入射面２６からは一対の弾性片３２が一体成形されており、両弾性片３２の先端部内面には係合爪３３が突出している。一方、外装部材２９の両側面には、弾性片３２がぴったりと納まるような側面溝３４が凹設されている。しかして、発光部２８は弾性片３２を側面溝３４に納めるようにして弾性片３２間に挟持されており、弾性片３２の係合爪３３を背面に係合することによって脱落しないよう保持されている。

【００２０】光入射面２６の発光部２８と対向する位置、すなわち弾性片３２間の部分には、多数のプリズムからなるプリズムアレイ状の光学的パターン３５が形成されている。

【００２１】図５は導光板２２の下面に設けられた拡散パターン２４を示す平面図である。この拡散パターン２４は多数の拡散パターン素子２４ａからなり、拡散パターン素子２４ａは、点光源３０を中心として導光板２２の下面全面に同心円状に配置されている。また、拡散パターン素子２４ａはランダムに配置されており、各拡散パターン素子２４ａどうしは点光源３０からの距離が遠くなるにつれてピッチが短くなっており、点光源３０から離れるに従って拡散パターン密度が次第に大きくなっている。

【００２２】しかして、プリズムアレイ状の光学的パターン３５に対向して配置された発光部２８から出射された光ｆは、前方に偏って導光板２２内に導入されることがなく、図６に示すように、光学的パターン３５を構成する各プリズムで屈折することによって広い範囲にわたって導光板２２内部へ導かれる。従って、光入射面２６の両側の隅部分にも光が到達し、当該隅部分が明るくなって面光源装置２１の輝度分布が均一化される。さらに、導光板２２の下面には、図５に示したような拡散パターン２４が形成されているので、発光部２８から導光板２２へ入射した光は、導光板２２の各領域で均等に出射され、導光板２２の全面で均等な輝度分布を得ることができる。

【００２３】なお、上記光学的パターン３５としては、点光源３０から入射してきた光を両側へ散らばらせることができるようなものであればよく、特に限定されるものではない。例えば、図７に示すような略凹面状のレンズ部分からなるレンズアレイ状の光学的パターン３５でもよく、しぼ加工などでもよい。

【００２４】（第２の実施形態）図８は本発明の別な実施形態による面光源装置４１を示す平面図である。この

面光源装置４１にあっては、導光板２２の光入射面２６に凹部４２を設け、当該凹部４２の奥に光学的パターン３５を形成している。発光部２８からは全面及び両側面に光を出射するようになっている。

【００２５】従って、発光部２８から両側方へ出射された光ｆは、凹部４２の側面から導光板２２に入射して隅部分に達する。また、発光部２８から前方へ出射された光ｆは、凹部４２の前面から導光板２２に入射し、光学的パターン３５で拡散されて導光板２２の全体に広がる。従って、この面光源装置４１にあっても、導光板２２の隅部分が暗くなることがなく、面光源装置４１の輝度分布を均一化することができる。

【００２６】（第３の実施形態）図９は本発明のさらに別な実施形態による面光源装置４３を示す分解斜視図である。この面光源装置４３にあっては、導光板２２の光入射面２６側の端部中央部に略半円形をした凹部４４を設けてある。一方、発光部２８は、発光ダイオード等の発光素子チップ４５を透明樹脂４６で封止した点光源３０（発光素子）を、表面反射率の大きな白色樹脂等からなる外装部材２９内に埋め込んだものである。この外装部材２９の前面には、導光板２２の凹部４４に合致する形状の突部４７が突出しており、突部４７の上下方向中央部には、突部４７全幅にわたってスリット４８が開口されており、スリット４８を通して点光源３０が露出している。図１１に示すように、スリット４８の開口高さは、点光源３０の高さよりも狭くなっている。

【００２７】しかして、点光源３０から出射された光ｆは、白色樹脂等からなる外装部材２９で反射されることによって外装部材２９内に閉じ込められてスリット４８からのみ外部へ出射される。しかも、スリット４８の開口高さは点光源３０の高さよりも小さくなっているので、光の結合効率が向上する。

【００２８】また、図１０に示すように、発光部２８のスリット４８を通して略１８０° の角度で放射された光ｆは、導光板２２の凹部４４内面から導光板２２内部に導かれる。よって、光ｆは導光板２２の全体に広がり、特に導光板２２の隅部分にも達して隅部分の輝度を高くすることができ、面光源装置４３の輝度分布を均一化することができる。

【００２９】（照明装置）図１２は本発明にかかる面光源装置を利用した照明装置７１を示す分解斜視図である。この照明装置７１においては、光量を大きくして輝度を高くするため、４つの発光部２８を用いて導光板２２の略半円形をした凹部４４にはめ込んでいる。この照明装置７１は室内照明用や自動車のテールランプなどに用いられるものである。

【００３０】（液晶表示装置）図１３は本発明にかかる面光源装置８０を用いた液晶表示装置８１を示す分解斜視図である。この面光源装置８０にあっては、導光板２２の光入射面２６に赤（Ｒ）、緑（Ｇ）、青（Ｂ）の３色の点光源３０（発光部）が設けられている。面光源装置８０の前面には、拡散反射シート８２が配置され、その前面に液晶表示パネル８３が配設されている。液晶表示パネル８３は、透明電極やＴＦＴ、カラーフィルタ、ブラックマトリクス等を形成された２枚の液晶基板（ガラス基板、フィルム基板）８４，８５間に液晶材料を封止し、液晶基板８４，８５の両外面に偏光板８６を配設したものである。

【００３１】このような液晶表示装置８１によれば、表示面の輝度分布が均一にすることができ、液晶表示装置８１の高品質化を図ることができる。

【００３２】（液晶表示装置を備えた電子装置）本発明にかかる液晶表示装置は、携帯電話や弱電力無線機のような無線情報伝達装置、携帯用パソコン、電子手帳や電卓のような情報処理装置などに用いるのに好ましい。図１４は本発明にかかる例えば図１３に示したような液晶表示装置８１をディスプレイ用に備えた携帯電話８９を示す斜視図、図１５はその機能ブロック図である。携帯電話８９の正面にはダイアル入力用のテンキー等のボタンスイッチ９０を備え、その上方に液晶表示装置８１が配設され、上面にアンテナ９１が設けられている。しかして、ボタンスイッチ９０からダイアル等を入力すると、入力されたダイアル情報等が送信回路９２を通じてアンテナ９１から電話会社の基地局へ送信される。一方、入力されたダイアル情報等は液晶駆動回路９３へ送られ、液晶表示装置８１が液晶駆動回路９３により駆動されてダイアル情報等が液晶表示装置８１に表示される。

【００３３】また、図１６は本発明にかかる例えば図１３に示したような液晶表示装置８１をディスプレイ用に備えた電子手帳９４を示す斜視図、図１７はその機能ブロック図である。電子手帳９４は、カバー９５を開くと、キー入力部９６と液晶表示装置８１を備えており、内部には液晶駆動回路９３や演算処理回路９７等が設けられている。しかして、例えばキー入力部９６からテンキーやカナキー等を入力すると、入力情報が液晶駆動回路９３に送られて液晶表示装置８１に表示される。ついで、演算キー等の制御キーを押すと、演算処理回路９７で所定の処理や演算が実行され、その結果が液晶駆動回路９３に送られて液晶表示装置８１に表示される。

【図面の簡単な説明】

【図１】点光源を用いた従来の面光源装置を示す分解斜視図である。

【図２】同上の面光源装置の断面図である。

【図３】同上の面光源装置における輝度分布のばらつきを示す平面図である。

【図４】本発明の一実施形態による面光源装置を示す分解斜視図である。

【図５】同上の面光源装置の拡散パターンを示す平面図である。

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【図6】同上の面光源装置における光学的パターンの作用説明図である。
【図7】別な光学的パターンの形状を示す平面図である。
【図8】本発明の別な実施形態による面光源装置を示す平面図である。
【図9】本発明のさらに別な実施形態による面光源装置を示す分解斜視図である。
【図10】同上の面光源装置の作用説明図である。
【図11】同上の面光源装置の作用説明図である。
【図12】本発明の面光源装置を用いた照明装置の分解斜視図である。
【図13】本発明の面光源装置を用いた液晶表示装置の分解斜視図である。
【図14】本発明にかかる液晶表示装置をディスプレイ用に備えた携帯電話を示す斜視図である。

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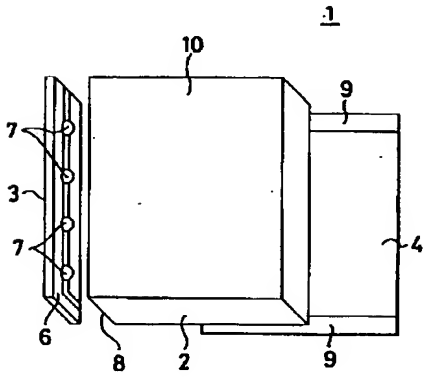
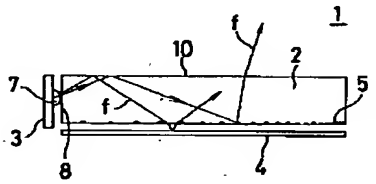
【図15】同上の携帯電話において液晶表示装置を駆動するための構成を示すブロック図である。
【図16】本発明にかかる液晶表示装置をディスプレイ用に備えた電子手帳を示す斜視図である。
【図17】同上の電子手帳において液晶表示装置を駆動するための構成を示すブロック図である。
【符号の説明】

22	導光板
23	光出射面
26	光入射面
30	点光源
35	光学的パターン
42	凹部
44	凹部
47	突部
48	スリット

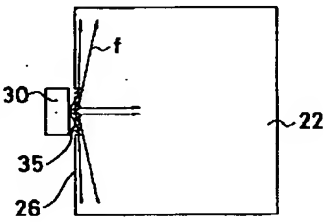
【図1】



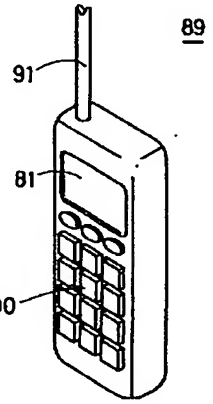
【図2】



【図6】



【図14】



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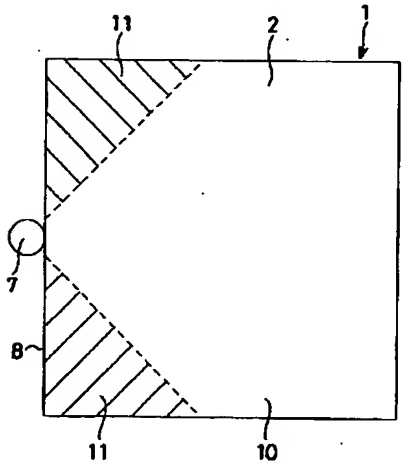
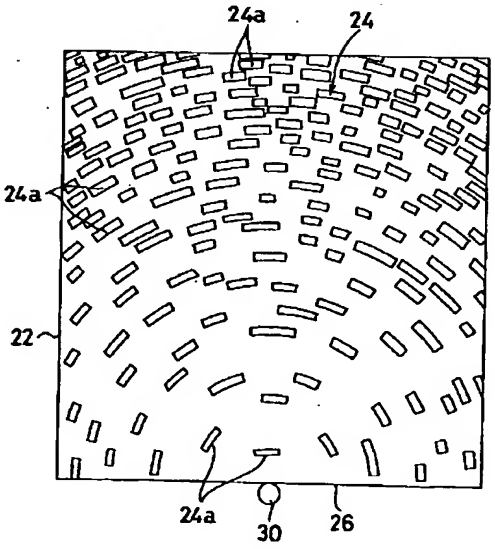
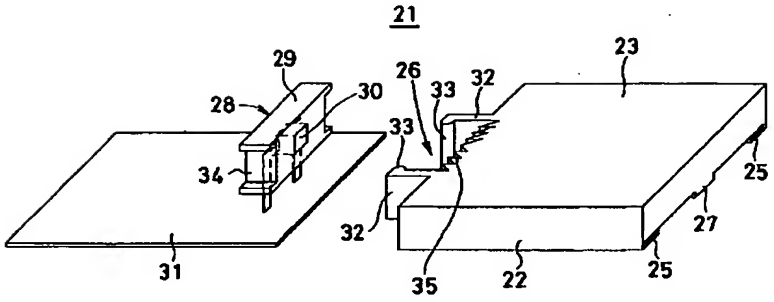


【図5】



【図4】



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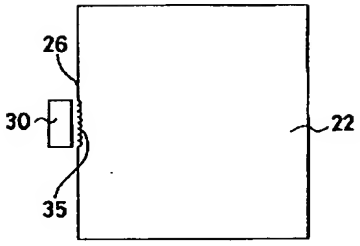

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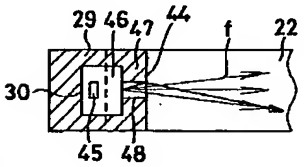
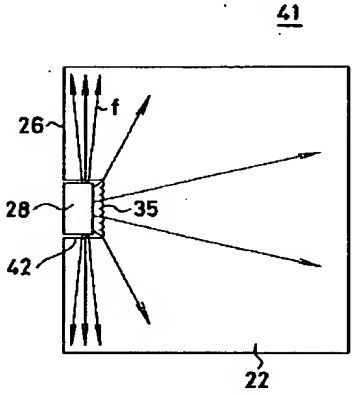
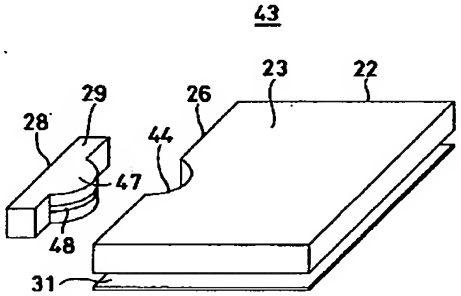


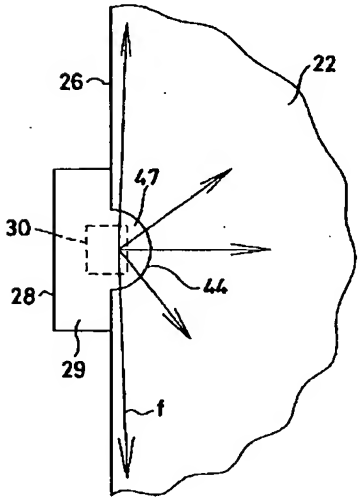
【図8】



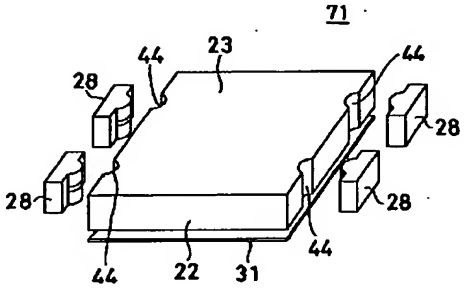
【図9】



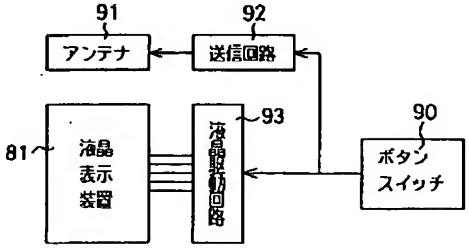
【図10】



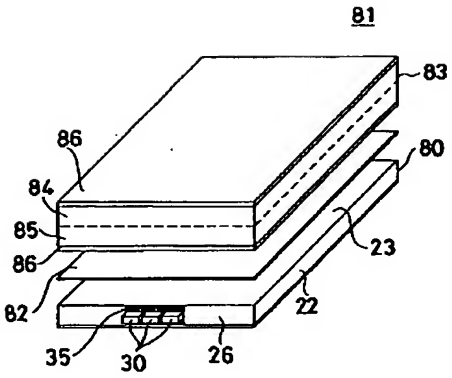
【図12】



【図15】



【図13】


81
83
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23
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22
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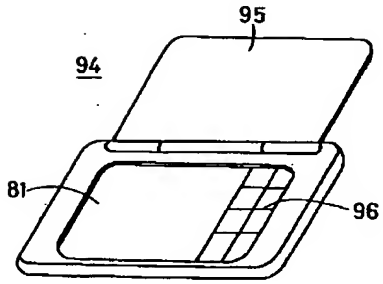
【図16】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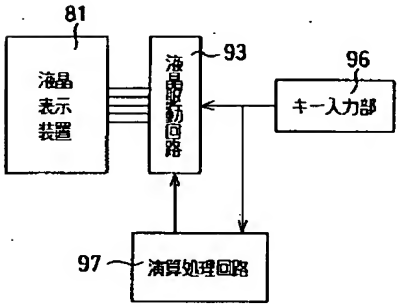
81
96

【図17】


81
液晶表示装置
93
液晶駆動回路
96
キー入力部
97
演算処理回路

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Surface light source equipment characterized by forming an optical pattern in the part which has been arranged at the optical plane-of-incidence side of the light guide plate for shutting up the light introduced from optical plane of incidence, and taking out from an optical outgoing radiation side to the exterior, and a light guide plate, and which counters in the surface light source equipment equipped with the small light source as compared with the width of face of the optical plane of incidence of a light guide plate with said light source of the optical plane of incidence of a light guide plate.
[Claim 2] Surface light source equipment according to claim 1 which dedicates said light source to the crevice established in the optical plane of incidence of a light guide plate, and is characterized by forming an optical pattern in the inside of the crevice concerned.
[Claim 3] In the surface light source equipment equipped with the small light source as compared with the light guide plate for shutting up the light introduced from optical plane of incidence, and taking out from an optical outgoing radiation side to the exterior, and the width of face of the optical plane of incidence of a light guide plate arranged at the optical plane-of-incidence side of a light guide plate Surface light source equipment characterized by covering its optical outgoing radiation side [of the space between the light source and a crevice], and opposite side side by the member of light reflex nature while forming a crevice in the optical plane of incidence of a light guide plate and arranging the light source to the crevice concerned.
[Claim 4] Surface light source equipment according to claim 3 characterized by having formed said crevice in the abbreviation hemicycle and forming the member of said light reflex nature in an abbreviation hemicycle.

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to surface light source equipment. Speaking concretely, this invention's relating to the surface light source equipment used for a liquid crystal display, a lighting system, etc.
[0002]
[Description of the Prior Art] The decomposition perspective view of drawing 1 and the sectional view of drawing 2 show the surface light source equipment 1 of the conventional example. Surface light source equipment 1 consists of the light guide plates 2, the light-emitting parts 3, and reflecting plates 4 for shutting up light. The light guide plate 2 is fabricated by the transparence of polycarbonate resin, methacrylic resin, etc. with resin with a big refractive index, and the diffusion pattern 5 is formed in the inferior surface of tongue of a light guide plate 2 of concavo-convex processing, dot printing of diffuse reflection ink, etc. The light-emitting part 3 mounted the so-called point light source 7 of two or more light emitting diodes (LED) etc. on the circuit board 6, and has countered the side face (optical plane of incidence 8) of a light guide plate 2. The reflecting plate 4 is formed for example, with the white resin sheet with a high reflection factor, and the both-sides section is stuck on it with the double-sided tape 9 on the inferior surface of tongue of a light guide plate 2.
[0003] A deer is carried out, and as shown in drawing 2 , the light f which outgoing radiation was carried out from the light-emitting part 3, and was led to the interior of a light guide plate 2 from the optical plane of incidence 8 is confined in the light guide plate 2 interior by carrying out total reflection in the light guide plate 2 interior. If incidence of the light f of the light guide plate 2 interior is carried out to the diffusion pattern 5, diffuse reflection of it will be carried out, and the light f reflected at the include angle smaller than the critical angle of total reflection towards the optical outgoing radiation side 10 is taken out from the optical outgoing radiation side 10 outside. Moreover, since it is reflected by the reflecting plate 4 and the light f which penetrated the part where the diffusion pattern 5 of light guide plate 2 inferior surface of tongue does not exist returns to the light guide plate 2 interior again, the quantity of light loss from light guide plate 2 inferior surface of tongue is prevented.
[0004]
[Problem(s) to be Solved by the Invention] The above surface light source equipments 1 using the point light source attained linear light source-ization in false by the point light source 7 for low-power-izing. That is, a linear light source like a cold cathode-ray tube is imitated by arranging the point light source 7 to a single tier. Therefore, in order to attain low-power-ization more, to reduce the number of the point light sources and to obtain surface light source equipment with little brightness dispersion by high brightness according to the one point light source preferably is desired.
[0005] However, when it was going to shine surface light source equipment 1 by the one point light source 7, as shown in drawing 3 , the amount of [by the side of the optical plane of incidence of a light guide plate 2 / 11 (field which gave the slash by drawing 3)] corner was not able to become dark, and it was not able to acquire uniform luminance distribution.

[0006] As compared with the dimension of a light guide plate, the amount of [by the side of optical plane of incidence] corner prevents becoming dark in the surface light source equipment using the small light source the place which this invention is made in view of the fault of the above-stated conventional example, and is made into the purpose, and it is shown in attaining equalization of luminance distribution.
[0007]
[Description of the Invention] Surface light source equipment according to claim 1 is characterized by forming an optical pattern in the part which has been arranged at the optical plane-of-incidence side of the light guide plate for shutting up the light introduced from optical plane of incidence, and taking out from an optical outgoing radiation side to the exterior, and a light guide plate and which counters in the surface light source equipment equipped with the small light source as compared with the width of face of the optical plane of incidence of a light guide plate with said light source of the optical plane of incidence of a light guide plate.
[0008] If it is in this surface light source equipment, since the optical pattern is formed in the light source of optical plane of incidence, and the part which counters, in case the light which came out of the light source carries out incidence to a light guide plate, light diffuses around by passing an optical pattern. Therefore, light diffuses also in a part for the corner by the side of the optical plane of incidence of a light guide plate, and it can prevent that the amount of corner concerned becomes dark. Therefore, also when using the small light source as compared with a light guide plate, the luminance distribution of surface light source equipment can be equalized.
[0009] In surface light source equipment according to claim 1, an embodiment according to claim 2 dedicates said light source to the crevice established in the optical plane of incidence of a light guide plate, and is characterized by forming an optical pattern in the inside of the crevice concerned.
[0010] If it is in an embodiment according to claim 2, since it establishes a crevice in the optical plane of incidence of a light guide plate and the light source is located in a crevice, light breadth-comes to be easy to a part for the corner of the surface light source from a crevice. Furthermore, when light is scattered about with an optical pattern, light breadth-comes to be easy to a part for the corner of a light guide plate, since the optical pattern is formed in the inside of a crevice further. Therefore, even when using the small light source as compared with a light guide plate, a part for the corner of a light guide plate can be made brighter, and the luminance distribution of surface light source equipment can be equalized.
[0011] The light guide plate for surface light source equipment according to claim 3 shutting up the light introduced from optical plane of incidence, and taking out from an optical outgoing radiation side to the exterior, While forming a crevice in the optical plane of incidence of a light guide plate and arranging the light source to the crevice concerned in the surface light source equipment which has been arranged at the optical plane-of-incidence side of a light guide plate and which was equipped with the small light source as compared with the width of face of the optical plane of incidence of a light guide plate It is characterized by covering its optical outgoing radiation side [of the space between the light source and a crevice], and opposite side side by the member of light reflex nature.
[0012] Moreover, the embodiment according to claim 4 is characterized by having formed said crevice in the abbreviation hemicycle and forming the member of said light reflex nature in an abbreviation hemicycle in surface light source equipment according to claim 3.
[0013] If it is in surface light source equipment given in claims 3 and 4, since the light source is arranged to the crevice established in the optical plane of incidence of a light guide plate, incidence of the light which came out of the light source is carried out from a crevice over the large range to a light guide plate. Therefore, light diffuses also in a part for the corner by the side of the optical plane of incidence of a light guide plate, and it can prevent that the amount of corner concerned becomes dark. Therefore, also when using the small light source as compared with a light guide plate, the luminance distribution of surface light source equipment can be equalized.
[0014] Moreover, without the light by which outgoing radiation was carried out from the light source carrying out incidence to a light guide plate, since its optical outgoing radiation side [of the space

between the light source and a crevice] and opposite side side is covered by the member of light reflex nature, it can prevent escaping from the clearance between the light source and a light guide plate to the upper part or a lower part, the joint effectiveness of light is raised, and the brightness of surface light source equipment can be made high.

[0015] Especially, like surface light source equipment according to claim 4, by forming the member of a crevice and light reflex nature in substantially anticircular, the light from the light source can be equally spread in each direction, and luminance distribution can be equalized more.

[0016]

[Embodiment of the Invention] Drawing 4 is the decomposition perspective view showing the surface light source equipment 21 by 1 operation gestalt of this invention. The top face of the light guide plate 22 currently formed with the transparence resin ingredient with a big refractive index is the optical outgoing radiation side 23, and the diffusion pattern 24 is formed in the inferior surface of tongue of concavo-convex processing, dot printing of diffuse reflection ink, etc. The reflecting plate attaching part 25 which carried out the groove is formed in the inferior-surface-of-tongue both-sides section of this light guide plate 22, and the stopper 27 has hung towards the lower part to the optical plane of incidence 26 of a light guide plate 22, and the end face of the opposite side.

[0017] A light-emitting part 28 wraps the small light source compared with the point light source 30 22, i.e., a light guide plate, by the sheathing member 29 which consists of the quality of the material with high surface reflection factors, such as white resin. For example, a light emitting device (point light source 30) like resin mold mold light emitting diode is wrapped in the sheathing member 29. Only the field by the side of optical outgoing radiation has exposed this point light source 30 from the sheathing member 29. The light by which carried out the deer and outgoing radiation was carried out in the direction of a tooth back or the direction of a side face from the point light source 30 is reflected by the inside of the sheathing member 29, and outgoing radiation of the light of the point light source 30 is efficiently carried out only from a front face. In addition, the point light source 30 of a miniature bulb etc. may be dedicated in the sheathing member 29 which consists of white resin etc., and a light-emitting part 28 may be formed.

[0018] The reflecting plate 31 is formed with the ingredient with a high surface reflection factor, for example, is formed with the hard or comparatively elastic white sheet plastic. This reflecting plate 31 is held on the light guide plate 22 inferior surface of tongue by inserting in the reflecting plate attaching part 25 from the optical plane-of-incidence 26 side, and calling on a stopper 27.

[0019] Moreover, from the optical plane of incidence 26 of a light guide plate 22, the elastic piece 32 of a pair is really fabricated and the engagement pawl 33 has projected to the point inside of both the elastic piece 32. On the other hand, the side-face slot 34 where the elastic piece 32 is settled exactly is cut in the both-sides side of the sheathing member 29. A deer is carried out, and as a light-emitting part 28 dedicates the elastic piece 32 to the side-face slot 34, it is pinched between the elastic pieces 32, and by engaging the engagement pawl 33 of the elastic piece 32 with a tooth back, it is held so that there may be no dedropping.

[0020] The optical pattern 35 of the shape of a prism array which consists of many prism is formed in the part between the light-emitting part 28 of the optical plane of incidence 26 and the location 32 which counters, i.e., an elastic piece.

[0021] Drawing 5 is the top view showing the diffusion pattern 24 prepared in the inferior surface of tongue of a light guide plate 22. This diffusion pattern 24 consists of much diffusion pattern component 24a, and diffusion pattern component 24a is arranged in the shape of a concentric circle all over the inferior surface of tongue of a light guide plate 22 focusing on the point light source 30. Moreover, the diffusion pattern consistency is becoming large gradually as diffusion pattern component 24a is arranged at random, as for each diffusion pattern component 24a, the pitch is short as the distance from the point light source 30 becomes far, and it separates from the point light source 30.

[0022] The light f by which carried out the deer and outgoing radiation was carried out from the light-emitting part 28 which countered the optical prism array-like pattern 35 and has been arranged is led to the light guide plate 22 interior over the large range by being refracted by each prism which constitutes

the optical pattern 35, as it inclines ahead, and is not introduced in a light guide plate 22 and it is shown in drawing 6 . Therefore, light also reaches a part for the corner of the both sides of the optical plane of incidence 26, the amount of corner concerned becomes bright, and the luminance distribution of surface light source equipment 21 is equalized. Furthermore, since the diffusion pattern 24 as shown in drawing 5 is formed in the inferior surface of tongue of a light guide plate 22, outgoing radiation of the light which carried out incidence from the light-emitting part 28 to the light guide plate 22 is equally carried out in each field of a light guide plate 22, and it can acquire equal luminance distribution all over a light guide plate 22.

[0023] In addition, it is not limited especially that what is necessary is just that in which the light which has carried out incidence from the point light source 30 can be scattered to both sides as the above-mentioned optical pattern 35. For example, the optical pattern 35 of the shape of a lens array which consists of a lens part of the shape of an abbreviation concave surface as shown in drawing 7 is sufficient, and crimp processing etc. is sufficient.

[0024] (2nd operation gestalt) Drawing 8 is the top view showing the surface light source equipment 41 by another operation gestalt of this invention. If it is in this surface light source equipment 41, a crevice 42 is established in the optical plane of incidence 26 of a light guide plate 22, and the optical pattern 35 is formed in the inner part of the crevice 42 concerned. From a light-emitting part 28, outgoing radiation of the light is carried out to the whole surface and a both-sides side.

[0025] Therefore, incidence of the light f by which outgoing radiation was carried out from the light-emitting part 28 to the method of both sides is carried out to a light guide plate 22 from the side face of a crevice 42, and it reaches a part for a corner. Moreover, incidence of the light f by which outgoing radiation was carried out from the light-emitting part 28 to the front is carried out to a light guide plate 22 from the front face of a crevice 42, it is diffused by the optical pattern 35, and spreads in the whole light guide plate 22. Therefore, even if it is in this surface light source equipment 41, the amount of [of a light guide plate 22] corner does not become dark, and the luminance distribution of surface light source equipment 41 can be equalized.

[0026] (3rd operation gestalt) Drawing 9 is the decomposition perspective view showing the surface light source equipment 43 by still more nearly another operation gestalt of this invention. If it is in this surface light source equipment 43, the crevice 44 which carried out the abbreviation hemicycle is established in the edge center section by the side of the optical plane of incidence 26 of a light guide plate 22. On the other hand, a light-emitting part 28 embeds the point light source 30 (light emitting device) which closed the light emitting device chips 45, such as a light emitting diode, by transparence resin 46 in the sheathing member 29 which consists of white resin with a big surface reflection factor etc. The projected part 47 of the configuration corresponding to the crevice 44 of a light guide plate 22 has projected, opening of the slit 48 is carried out to the vertical direction center section of the projected part 47 covering projected part 47 full one, and the point light source 30 is exposed to the front face of this sheathing member 29 through a slit 48. As shown in drawing 11 , the opening height of a slit 48 is narrower than the height of the point light source 30.

[0027] By being reflected by the sheathing member 29 which consists of white resin etc., the light f by which carried out the deer and outgoing radiation was carried out from the point light source 30 is shut up in the sheathing member 29, and outgoing radiation is carried out only from a slit 48 outside. And since the opening height of a slit 48 is smaller than the height of the point light source 30, the joint effectiveness of light improves.

[0028] Moreover, as shown in drawing 10 , the light f emitted at the include angle of 180 degrees of abbreviation through the slit 48 of a light-emitting part 28 is led to the light guide plate 22 interior from crevice 44 inside of a light guide plate 22. Therefore, Light f can be given to the whole light guide plate 22 also at a part for the corner of breadth, especially a light guide plate 22, can make the brightness for a corner high, and can equalize the luminance distribution of surface light source equipment 43.

[0029] (Lighting system) Drawing 12 is the decomposition perspective view showing the lighting system 71 using the surface light source equipment concerning this invention. In this lighting system 71, in order to enlarge the quantity of light and to make brightness high, it has inserted in the crevice 44

which carried out the abbreviation hemicycle of a light guide plate 22 using four light-emitting parts 28. This lighting system 71 is used for the object for indoor lighting, the tail lamp of an automobile, etc.
[0030] (Liquid crystal display) Drawing 13 is the decomposition perspective view showing the liquid crystal display 81 using the surface light source equipment 80 concerning this invention. If it is in this surface light source equipment 80, the point light source 30 (light-emitting part) of three colors of red (R), green (G), and blue (B) is formed in the optical plane of incidence 26 of a light guide plate 22. The diffuse reflection sheet 82 is arranged in the front face of surface light source equipment 80, and the liquid crystal display panel 83 is arranged in the front face. The liquid crystal display panel 83 closes a liquid crystal ingredient between two liquid crystal substrates (a glass substrate, film substrate) 84 which had the transparent electrode, TFT and a color filter, the black matrix, etc. formed, and 85, and arranges a polarizing plate 86 in both the external surface of the liquid crystal substrates 84 and 85.
[0031] According to such a liquid crystal display 81, the luminance distribution of the screen can make it homogeneity and quality improvement of a liquid crystal display 81 can be attained.
[0032] (Electronic instrument equipped with the liquid crystal display) The liquid crystal display concerning this invention is desirable although used for a wireless data transmission unit like a cellular phone or a weak-electric-current force walkie-talkie, a portable personal computer, an electronic notebook, an information processor like a calculator, etc. The perspective view and drawing 15 which show the cellular phone 89 which equipped the display with the liquid crystal display 81 which drawing 14 requires for this invention as shown, for example in drawing 13 are the functional block diagram. The transverse plane of a cellular phone 89 is equipped with the button switches 90, such as a ten key for a dial input, a liquid crystal display 81 is arranged in the upper part, and the antenna 91 is formed in the top face. If a deer is carried out and a dial etc. is inputted from a button switch 90, the inputted dial information will be transmitted to the base station of the telephone company from an antenna 91 through a sending circuit 92. On the other hand, the inputted dial information is sent to the liquid crystal drive circuit 93, a liquid crystal display 81 drives by the liquid crystal drive circuit 93, and dial information etc. is displayed on a liquid crystal display 81.
[0033] Moreover, the perspective view and drawing 17 which show the electronic notebook 94 which equipped the display with the liquid crystal display 81 which drawing 16 requires for this invention as shown, for example in drawing 13 are the functional block diagram. If an electronic notebook 94 opens covering 95, it has the key input section 96 and a liquid crystal display 81, and the liquid crystal drive circuit 93 and the data-processing circuit 97 grade are prepared in the interior. If a deer is carried out, for example, a ten key, a kana key, etc. are inputted from the key input section 96, input will be sent to the liquid crystal drive circuit 93, and will be displayed on a liquid crystal display 81. Subsequently, if control keys, such as an operator key, are pushed, processing and an operation predetermined in the data-processing circuit 97 are performed, and the result will be sent to the liquid crystal drive circuit 93, and will be displayed on a liquid crystal display 81.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the decomposition perspective view showing the conventional surface light source equipment using the point light source.
[Drawing 2] It is the sectional view of surface light source equipment same as the above.
[Drawing 3] It is the top view showing dispersion in the luminance distribution in surface light source equipment same as the above.
[Drawing 4] It is the decomposition perspective view showing the surface light source equipment by 1 operation gestalt of this invention.
[Drawing 5] It is the top view showing the diffusion pattern of surface light source equipment same as the above.
[Drawing 6] It is the operation explanatory view of the optical pattern in surface light source equipment same as the above.
[Drawing 7] It is the top view showing the configuration of another optical pattern.
[Drawing 8] It is the top view showing the surface light source equipment by another operation gestalt of this invention.
[Drawing 9] It is the decomposition perspective view showing the surface light source equipment by still more nearly another operation gestalt of this invention.
[Drawing 10] It is the operation explanatory view of surface light source equipment same as the above.
[Drawing 11] It is the operation explanatory view of surface light source equipment same as the above.
[Drawing 12] It is the decomposition perspective view of the lighting system using the surface light source equipment of this invention.
[Drawing 13] It is the decomposition perspective view of the liquid crystal display using the surface light source equipment of this invention.
[Drawing 14] It is the perspective view showing the cellular phone which equipped the display with the liquid crystal display concerning this invention.
[Drawing 15] It is the block diagram showing the configuration for driving a liquid crystal display in a cellular phone same as the above.
[Drawing 16] It is the perspective view showing the electronic notebook which equipped the display with the liquid crystal display concerning this invention.
[Drawing 17] It is the block diagram showing the configuration for driving a liquid crystal display in an electronic notebook same as the above.
[Description of Notations]
22 Light Guide Plate
23 Optical Outgoing Radiation Side
26 Optical Plane of Incidence
30 Point Light Source
35 Optical Pattern
42 Crevice

44 Crevice
47 Projected Part
48 Slit

[Translation done.]

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2.**** shows the word which can not be translated.
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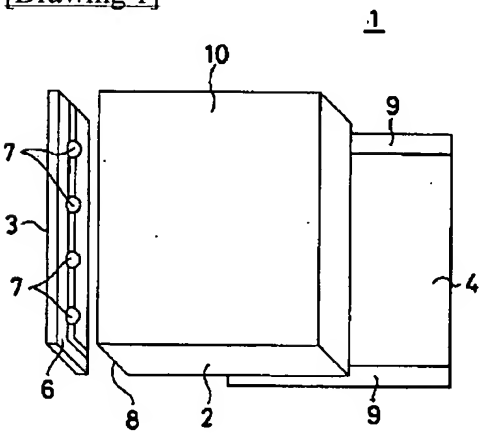
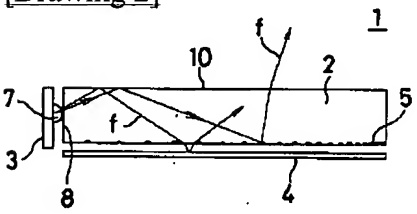
DRAWINGS

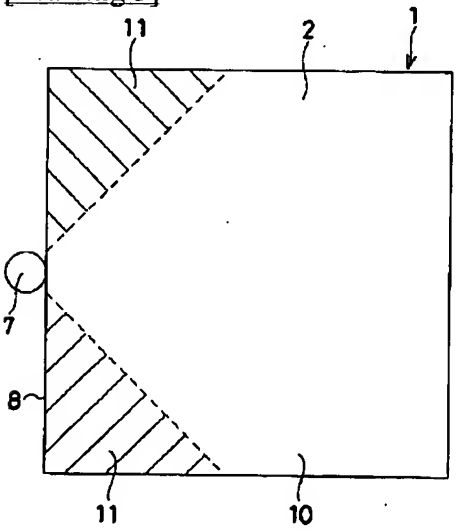
[Drawing 1]



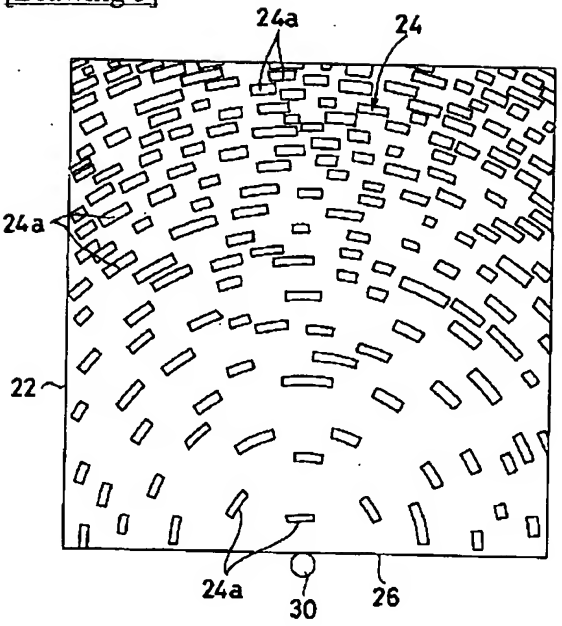
[Drawing 2]



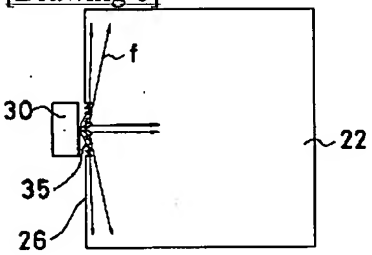
[Drawing 3]



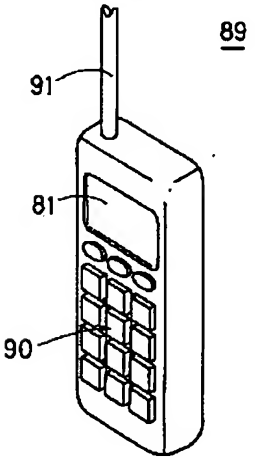
[Drawing 5]



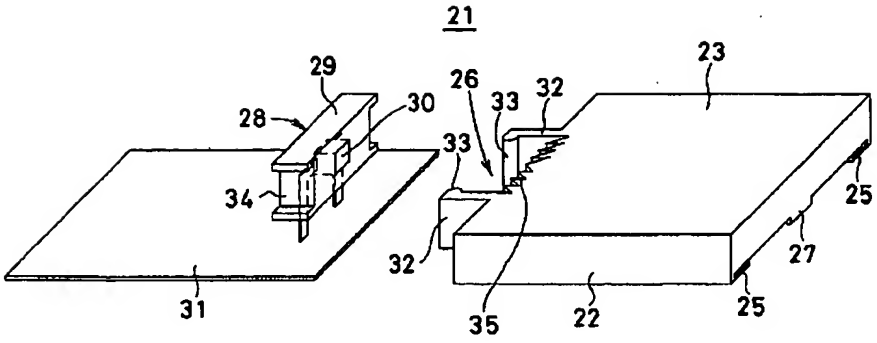
[Drawing 6]



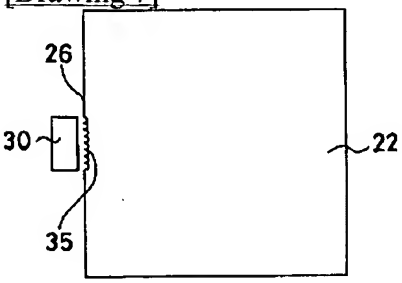
[Drawing 14]



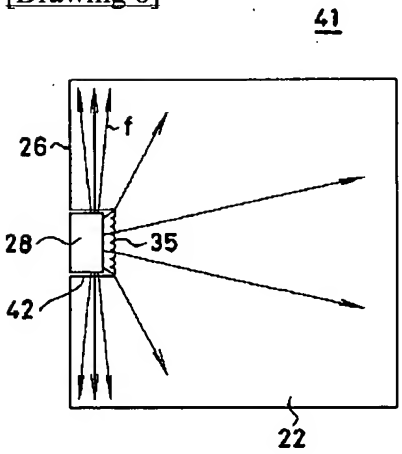
[Drawing 4]



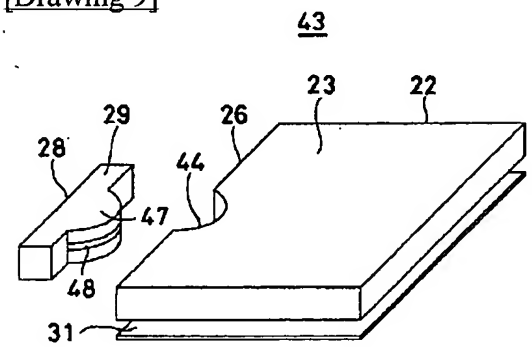
[Drawing 7]



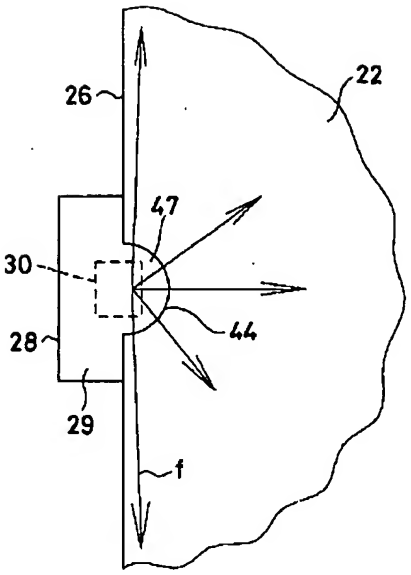
[Drawing 8]



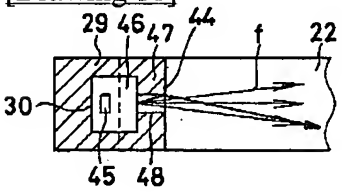
[Drawing 9]



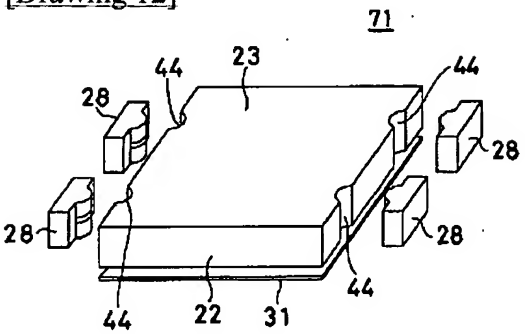
[Drawing 10]



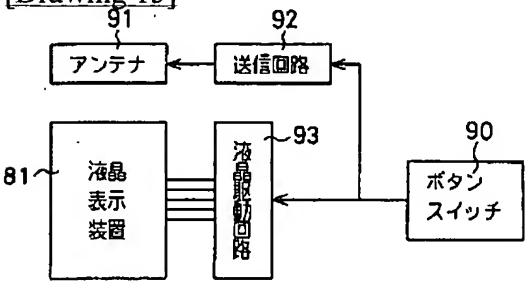
[Drawing 11]



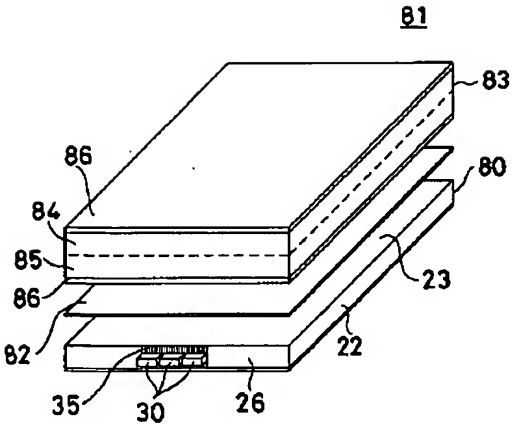
[Drawing 12]



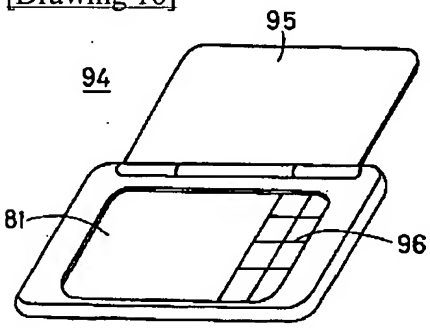
[Drawing 15]



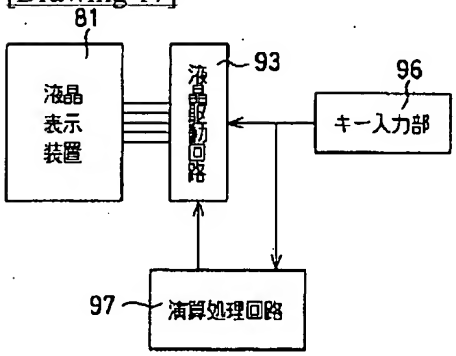
[Drawing 13]



[Drawing 16]



[Drawing 17]



[Translation done.]